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Examination of the Relationships between Fifth Graders' Self-Regulated Learning Strategies, Motivational Beliefs, Attitudes, and Achievement

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Abstract

The aim of current study was to examine predictor and explanatory relationships between fifth graders' self-regulated learning strategies, motivational beliefs, attitudes towards mathematics, and academic achievement. The study was conducted on a sample of 204 students studying in the primary schools of Afyonkarahisar province. Motivated Strategies for Learning Questionnaire (MSLQ) and Mathematics Attitude Scale (MTÖ) were used as data collection tools. In the current study, two different models were proposed. In first and second model, respectively, how motivational belief and self-regulated learning strategies explained the attitude and achievement was examined and how motivational beliefs explained self-regulated learning strategies. According to findings obtained from the study, metacognitive self-regulation, self-efficacy, task value, intrinsic goal orientation predicted the attitude towards mathematics, while self-efficacy and test anxiety predicted the achievement. However, task value, self-efficacy and intrinsic goal orientation predicted self-regulated learning strategies.

Key Words

Motivational Beliefs, Self-regulated Learning, Metacognitive, Attitude, Primary Education.

Self-regulation capacity, suggested first by Albert Bandura and, one of six principles that socio-cognitive theory based on, focus on considering one's competences and capacity about his/her behaviours (Bandura, 1982; Çiltaş & Bektaş, 2009; Senemoğlu, 2009). An early definition about self-regulation was made in a symposium at the American Educational Research Education (Zimmerman, 1986, 2008). Systematic use of metacognitive, motivational and behavioral strategies in the course of time have been a key feature of self-regulation definition (Zimmerman, 1990, 2001).

Self-regulation perspective has replaced the information processing perspective. Self-regulation including contextual, cognitive, motivational and affective factors suggests a much richer definition on learning (Biggs, 1993; Boekaerts & Niemivirta, 2000; Pintrich, 2000a, 2000b).

In the literature, although self-regulated learning is dealt with differently by many scholars, it might be defined as an active and constructive process that learners set goals, monitor their learning and participate their learning cognitively, motivationally and metacognitively through controlling their

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motives and cognitions (Pintrich, 2000a; Schunk, 2005; Zimmerman, 1986, 1989). According to Zimmerman (1998), self-regulation is not a mental ability like intelligence or an academic skill like reading. Rather, it is a self-management process that students transform their mental ability to academic skill. In the study of Puustinen and Pulkkinen (2001), the researchers compare self-regulation models and researchers emphasizes self-regulated learning play an active role on students' own learning process in a behavioral, cognitive, and motivational way.

In this process, self-regulatory learners use cognitive (rehearsal, elaboration, organization) metacognitive (planning, monitoring, regulation), and behavioral strategies (help setting, time and environment management etc.) and motivational elements have an important position in this process (self-efficacy, intrinsic and extrinsic goals, task value etc.). Cognitive strategies such as rehearsal, elaboration and organization make an active and a systematic information-processing through their own characteristic. Metacognition, defined variously as 'thoughts about thoughts' or 'awareness and control' of one's thoughts, is considered by many to be an essential component of skilled performance, influencing memory functions, learning and skill acquisition, and problem-solving (Hudlicka, 2005, p. 55). Metacognition consists of both metacognitive knowledge and cognitive experience. Metacognitive knowledge refers to the general knowledge that students have about their own or others' cognitive processes. This knowledge has been gained through experiences. Metacognitive experiences include the processes of evaluating and regulating one's ongoing cognition. The activities of metacognitive self-regulation consist of 3 general processes namely planning, monitoring, control processes (Pintrich, Smith, Garcia & Mckeachie, 1991; Stolp & Zabrucky, 2009). These strategies help students to know, control cognitive strategies and monitor them while performing cognitive strategies (Akın, 2006). Behavioral strategies that are another dimension of self-regulation take into account individual's efforts to control on their own behavioral and stands as another element of self-regulation.

Motivational beliefs is another dimension of self-regulation. Motivational beliefs consist of self-efficacy, task value, goal orientation, control belief, and test anxiety. Motivational variables are in interaction with contextual, behavioral and cognitive factors and influence self-regulation. The studies comparing bad and good self-regulations determine that some motivational processes are different in terms of the levels of self-regulation (Kaplan & Midgley, 1997; Pintrich, Anderman, & Klobucar, 1994; Pintrich & De Groot, 1990; Pintrich, Roeser, & De Groot, 1994).

Self-regulated learning is seen as a mechanism thathelps in explaining the achievement differences among students and it means that it is an indicator of improvement in achievement (Schunk, 2005, p. 85). There are many studies explaining the relationhips between achievement and self-regulated learning in the literature. It is demonstrated that there is relationships between self-regulated learning strategies and motivational beliefs in different grades and different lessons and self-regulated learning strategies improved skills such as writing composition (Canca, 2005; Ergöz, 2008; Garavalia & Gredler, 2002; Glaser & Brunstein, 2007; Haşlaman, 2005; Kitsansas, Sten & Huie, 2009; Ruban & Reis, 2006; Zimmerman, Bandura & Martinez-Pons, 1992). Duncan and McKeachie (2005) state that students' motivations might vary in different lessons and students might use different strategies in accordance with nature of the task. During the last two decades of the 20th century, important changes have emerged in mathematics education. A major shift certainly is that mathematics is no longer mainly conceived as a collection of abstract concepts and procedural skills to be mastered, but primarily as a set of human sense-making and problem-solving activities based on mathematical modeling of reality (De Corte, Verschaffel, & Op'teynde, 2000, p. 687) . From this point of view, student's use of various cognitive and metacognitive strategies to regulate on their own cognition, behavior and motivation in self-regulated learning might be appropriate for the nature of mathematical insights and sense-making.

In our country, although there are relational and experimental studies with regard to this topic, it is seen that studies are generally conducted with college students and concentrate on relationships between achievement and self-regulation. Studies about relationships between self-regulation and motivational and affective variables might bring a different perspective to the concept of self-regulation.

After students have completed an academic task, they may have emotional reactions to the outcome. The attributions students make for success or failure can lead to more complicated emotions such as pride, anger, shame and guilt. As students reflect

on reasons for their performance, the quality of attributions and emotions are important outcomes of self-regulation processes (Pintrich, 2000a, 2004; Weiner, 1986). It might be expected that the attitudes of students towards lesson or academic task might increase as they use self-regulation learning actively. There are few study concerning relationships between attitude and self-regulated learning. In the study of Arsal (2009), self-regulated learning program was implemented in the fourth grade students in mathematics. It is found that that self-regulated learning program increases students' attitude towards mathematics.

In this sense, the main purpose of current study was to examine predictive and explanatory relationships between fifth graders' motivational beliefs, cognitive and metacognitive self-regulation strategies, their attitudes toward mathematics and mathematics achievement.

Method

Research Design

This research was designed with relational screening model which is one of the general screening models. Relational screening is a research model which aims to determine the existence and/or degree of joint variation between two or more variants. Relational screening model might be a good alternative in cases where experimental model is not used (Karasar, 2009). In education for most of causation are not appropriate for experimental manipulation, it is not sometimes possible to experiment on variables (Balcı, 2004, p. 228).

Participants

The sample of this study consisted of 204 students being taught in various primary schools in Afyonkarahisar, Turkey, 95 (46.6%) of whom were female and 104 (54.4%) of whom were male.

Instruments

Motivated Strategies for Learning Qestionnaire (MSLQ): MSLQ, developed by Pintrich and his colleagues (1991), was adapted to Turkish by Karadeniz, Büyüköztürk, Akgün, Kılıç-Çakmak, and Demirel (2008). Motivation part of MSLQ consists of six dimensions: self-efficacy, test anxiety, intrinsic goal orientation, extrinsic goal orientation, control of learning beliefs, and task value. Motivation part includes 25 items. Learning strategies part of MSLQ consists of cognitive, metacognitive and resource management strategies. Learning strategies part includes 45 items.

Mathematics Attitude Scale (MTO): It was developed by Askar (1986) in order to measure students' attitude towards mathematics. MTO, is a five-point likert-type scale and consists of 20 items.

Mathematic Achievement: Students' grade point average (GPA) scores in mathematics were assessed as achievement variable.

Process

Instruments were administered in the fall term of 2010-2011 academic year. Before implementation, permission was granted from responsible authorities. Afterwards, the researchers went to the specified schools and conducted the study with voluntary students by getting the permission of the teachers as well.

Analysis of Data

In the current study, structural equation modeling (SEM) was used to determine how independent variables predict dependent variables. SEM is a standard tool used by biologist, economists, educators, marketing researcher, medical researchers, and behavioral scientists to analyze theoretical models that might explain the relationships among a series of variables. One reason for its pervasive use in many scientific fields of study is that SEM provides researchers with a comprehensive method for testing of theories and takes into account the measurement error (Hu & Bentler, 1999; Raykov & Marcoulides, 2000). The data were analyzed via LISREL 8.7.

Limitations

Several limitations of the study are as follows; firstly, the number of the sample is limited. This situation might restrict the generalization of the results. Secondly, although SEM put forwards the results about causal relationships, refering a full description of the relationships between variables is difficult. Finally, all the student motivation, attitude, and learning strategies were measured with a self-report instrument. For the generalization of the results, they should be supported by the studies conducted with various data collection tools.

Results

Two models were proposed to examine how cognitive and metacognitive strategies and motivational beliefs explained attitude towards mathematics and mathematics achievement and how motivational beliefs explained cognitive and metacognitive strategies.

According to first model, test anxiety (-21) predicted attitude towards mathematics in a negative way, while metacognitive self-regulation (.15), intrinsic goal orientation (.16), task value (.27), and self-efficacy (.60) positively predicted attitude towards mathematics in a positive way. Test anxiety, metacognitive self-regulation, intrinsic goal orientation, task value, and self-efficacy explained the 58 % of the variance of the attitude towards mathematics. On the other hand, self-efficacy (.60) predicted achievement in a positive way, test anxiety (-12) predicted achievement in a negative way. Other variables did not have a meaningful effect on academic success. Self-efficacy and test anxiety accounted for 41 % of mathematic achievement. Fit indexes of the model were as follow: x^2/ sd =1.5, RMSEA=.052, S-RMR=.023, GFI=.99, AGFI=.94, CFI=1. According to the results, the model was found to be excellent fit (Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 1999; Schermelleh-Engel, Moosbruger, & Müller, 2003; Steiger, 2007).

According to second model, intrinsic goal orientation (.28), task value (.28), and self-efficacy (.29) predicted cognitive strategies in a positive way. Similarly, intrinsic goal orientation (.35), task value (.26), and self-efficacy (.25) predicted metacognitive self-regulation strategies in a positive way. Metacognitive self-regulation, task value, and self-efficacy have explained 57% of the variance in cognitive strategies and 56% of the variance in metacognitive strategies. Fit indexes of the model were as follow: x^2/ sd=.3, RMSEA=.0, S-RMR=.012, GFI=1, AGFI=.99, CFI=1. According to the results, the model was found to be excellent fit (Hooper et al., 2008; Hu & Bentler, 1999; Schermelleh-Engel et al., 2003; Steiger, 2007).

Discussion

The main purpose of current study was to examine predictive and explanatory relationships between fifth graders' motivational beliefs, cognitive and metacognitive self-regulation strategies, their attitudes toward mathematics and mathematics achievement. It was supposed that the results that present theoretical and applied data would lead the way theorists and educators in terms of theory and practice.

In the literature, although it is emphasized that there is a relationship between achievement and self-regulated learning strategies, the findings of previous research are somewhat contradictory. Therae are many studies conducted with high school students and university students showing that student's self-regulated learning strategies play an important role in predicting their academic achievement (Cheng, 2011; Lindner & Harris, 1992; Pintrich & De-Groot, 1990; Üredi & Üredi, 2005; Zimmerman & Martinez-Pons, 1986). However, Yumuşak, Sungur, and Çakıroğlu (2007) found that rehearsal strategy was found to be predictor of achievement in a negative way, while organization strategy was a predictor of achievement in a positive way in biology. Metacognitive strategies were not a predictor of achievement in biology. Similarly, in the study of Ergöz (2008) it was shown that there were not relationships between cognitive and metacognitive strategies and achievement. There is still need for much research on self-regulated learning in different cultures and conditions (Olaussen & Braten, 1999). The situations that students get their education and the characteristics of the programs may be effective in finding these results.

Although it is hypothesized that intrinsic goal orientation predicts achievement in a positive way, it wasn't a direct predictor of mathematics achievement. The findings of some research are consistent with this study (Pintrich & De Groot, 1990; Yumuşak et al., 2007), whereas some research demonstrated that intrinsic goal orientation was a predictor of achievement in positive way (Bembenutty, 2005; Ergöz, 2008). Extrinsic goal orientation was not found to be a predictor of achievement although extrinsic motivations such as getting a reward or grade or performing much better than others after the completion of a task is supposed to predict academic achievement in a negative way. Pintrich (1999) found a relationship between achievement and extrinsic goal orientation in a negative way. Ergöz found that extrinsic goal orientation was not a predictor of achievement for all students, whereas extrinsic goal orientation was a predictor of boy's achievement in a positive way.

Task value was not a direct predictor of achievement in fifth grade level. It was seen that research on this topic presented various results in different culture and grade level. In the study of Haşlaman (2005), task value was not a predictor of achievement for programming courses. However, in the

study of Zusho and Pintrich (2003), task value was found to be a predictor of achievement for chemistry.

Control belief was not a direct predictor of mathematics achievement in the study. Pintrich et al. (1991) suggested that if students believed their efforts would make a difference in their learning, most probably they would study in a more strategic and effective way. The reason why this study demonstrates such a result might be the fact that the teachers may not encourage their students to work autonomously and independently.

When the contribution of self-efficacy to students' achievement in mathematics was considered, it found that self-efficacy was a significant predictor of achievement in mathematics in positive way. According to Schunk (1990), students who had low self-efficacy for learning may avoid tasks while those judging themselves efficient were more likely to participate into the tasks (p. 74). When facing difficulties, students having high self-efficacy spent more effort and persist longer than students that had low self-efficacy (Schunk, 1981). The results obtained support these ideas. Similarly, when the current research was considered, it was seen that the some results of many research were consistent with this results (Andrew & Vialle, 1998; Bembenutty, 2005; Ergöz, 2008; Haşlaman, 2005; Pajares & Graham, 1999; Pintrich & De Groot, 1990; Schunk, 1981; Üredi & Üredi, 2005; Zimmerman, 2000; Zusho & Pintrich, 2003).

Test anxiety was found to be anotherpredictor of achievement in mathematics in negative way. Mcdonald (2001) pointed that if the students' levels of anxiety during or before test were above the optimum level, students might fail to show their actual ability. Similarly, the findings of previous researches are consistent with this result (Elliot & McGregor, 1999; O'Tuel & Terry, 1979; Pintrich & De Groot, 1990; Üredi & Üredi, 2005). According to Hill and Wigfiled (1984), one of most important reasons for test anxiety is to test very often. assessment methods and school reports should be modified to cope with the test anxiety.

Metacognitive self-regulation is thought to be related with the attitudes towards mathematics. Metacognitive self-regulation is found to be a predictor of attitude towards mathematics in a positive way. Individuals develop overnership, control and awareness mechanisms when they make self-regulation. These mechanisms, developed by individuals, might have an increasing effect on their attitudes towards a course. However, cognitive strategies such as rehearsal, elaboration, and organization do not have an effect on attitude towards mathematics.

Goal orientation is the response of student to question of ''why do I perform this task?" (Eccles & Wigfield, 2002). As expected, student's intrinsic goal orientation increases attitude towards lesson. However, studying for the reasons of showing their abilities to others and receiving just good grades without the ultimate aim of mastering the task do not have an effect on attitude towards mathematics. Similarly, when the contribution of control belief to students' attitude towards mathematics is considered, it is not a predictor of attitude.

Task value is another variable whose effect was studied on attitude towards mathematics. As expected, task value was a predictor of attitude towards mathematics. Individual's high perception with respect to importance of task increases attitude towards mathematics. Control belief is not a direct predictor of attitudes towards mathematics.

Students that have low self-efficacy perceive more difficult tasks and develop stress, depression (Bandura, 1993) and a narrow perspective to solve a problem. In contrast students that have high self-efficacy approach to the tasks more calmly and in a comfortable way (Pajares, 1996, 2002). In this sense, high self-efficacy has a positive effect on attitude on mathematics attitude. As expected, test anxiety was a predictor of attitude towards mathematics in a negative way. Students' emotions such as worry, tension, and fear caused to decrease attitude towards mathematics.

When the contribution of motivational beliefs to students' cognitive and metacognitive strategies was considered, intrinsic goal orientation was founded to be a predictor of cognitive and metacognitive strategies. It was found that intrinsic goal orientation was related to cognitive strategies at the level of .28 and metacognitive strategies at the level of .35. The results are consistent with previous research (Pintrich, 1999; Pintrich & De Groot, 1990; Teresa & Pintrich, 1991). Although it was supposed that extrinsic goal orientation was a predictor of cognitive and metacognitive strategies in a negative way, it was found out to be a predictor of cognitive and metacognitive.

Task value, which students perceive as important and useful, have a positive effect on cognitive and metacognitive strategies. However, Pintrich and Schrauben (1992) suppose that task value do not have a direct effect on academic performance, but

it is related to cognitive processing. The result supported this view.

Although it was hypothesized that control belief influenced cognitive and metacognitive strategies in a positive way, it was not found to be a predictor of cognitive and metacognitive strategies.

Self-efficacy, supposed to be a predictor of cognitive and metacognitive strategies, was related to metacognitive strategies at the level of .25 and cognitive strategies at the level of .29. In the study of Pintrich and De Groot (1990), self-efficacy was related to both cognitive strategies and metacognitive strategies. In keeping with the literature, self-efficacy has a facilitator role in cognitive processing and increases the use of cognitive strategy.

Though test anxiety was supposed to be a predictor of cognitive and metacognitive strategies, it was not found to be predictor of cognitive and metacognitive strategies. As the test anxiety concerns with negative emotion in the course of the test, it might not influence cognitive and metacognitive strategies.

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